

Developmental Trend of the World Crude Oil Trade Spatial Pattern

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Abstract

As per the data of world crude oil exploitation-reserve ratio, this paper analyzes the short, middle and long-term supply situation of the world oil trade; based on the demand forecasts by the International Energy Agency and US Department of Energy, proposes that North America, Asia and Europe will remain the world oil importing regions, while China, India, the United States and Korea will become the world's largest importers; Finally, based on the supply and demand analysis, concludes the developmental trend of the world crude oil spatial pattern.

Key words: Crude oil; Trade pattern; Ratio of exploitation and reserve; Demand

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INTRODUCTION

Resource reserve is a decisive factor of trade spatial pattern, the change in resource directly affects the formation of spatial pattern. As per the 2013 extraction rate, the world's oil extraction ratio is 52.9. For different countries, due to the different levels of the national oil

industry development, national oil policies as well as the huge resource differences, there is a great difference among the oil resource exploitable time in countries. With the changes in resource endowment, regional difference in oil consumption is also changing, so the spatial pattern of the world crude oil trade keeps evolving.

1. ANALYSIS OF THE WORLD'S CRUDE OIL PRODUCTION-RESERVE RATIO

1.1 Middle East

Oil resource in the Middle East is very rich. As per the 2013 data released by BP, the oil reserve in the region accounts for 48.4% of the world, so although oil production rate in the region is much higher than in other regions of the world, estimating by the 2013 production rate, its exploitable life is 78.1 years, ranking the first in the world. Among the countries in the Middle East, Iran and Iraq are at the forefront in the Middle East with more than 100 years of exploitable time. Kuwait ranks the third with 88.7 years of exploitable time; followed by the United Arab Emirates, Saudi Arabia and Yemen, etc. Among the countries with the first 10 oil recoverable reserve rate in the world, five countries are in the Middle East. Resource endowment is the decisive factor of regional function tendency, so in the long term, Middle East is still the exporter in the world's crude oil spatial pattern.

1.2 North America

As per the 2013 ratio of recoverable reserves, the North American's crude oil recoverable time is 38.7 years, higher than Africa, European and Asian continent and the Asia Pacific region. Looking from the recoverable reserve ratio of different countries in the North America, the United States' oil reserve is at the end among three countries, whose recoverable reserve ratio is only 10.7. Canada's reserve ranks the second, but recoverable time

is the longest which is more than 100 years. Mexico has the highest reserves, whose recoverable reserve ratio is only 10.6, the same with the United States. Currently about 50% crude oil of the United States is imported from Canada and Mexico, and the main exporting direction of Canada and Mexico is the United States. Therefore, the oil depletion in Canada and Mexico will cut off the oil trade with the United States, and the United States, as a big oil-consuming country, will increase the crude oil import outside of North America.

1.3 Europe and Eurasia

In 2013, Europe and Eurasia's proven oil reserves are 140.8 billion barrels, accounting for 8.4% of total world reserves, with a recoverable reserve ratio of 22.4. For the proven reserves in the region, more than half is in Russia, but Russia is the world's largest oil producer, whose crude oil reserve in 2013 is 87.2 billion barrels, so despite of the high reserve, calculating based on the current production, its ratio of recoverable reserve is not high of only 22.4 years. Therefore, under the premise of no new large oil fields discovered, Russia is only a major middle-term exporter in the world's crude oil trade pattern, whose long-term is unsustainable. In Central Asia, Kazakhstan is a country with rich oil reserve in the region, with a proven reserve of 300 billion barrels, accounting for 1.8% of world oil reserves. Calculating based on the current annual oil production rate, the recoverable reserve rate of Kazakhstan is 47.4 years, so this country may become a long-term supplier in the world crude oil market. Among the other exporting countries, Azerbaijan's recoverable reserve ratio is 21.9, which is another middle-term crude oil supplier in the world oil trade. Norway and Denmark's exploitable time is both less than 100 million barrels. They are currently changing from exporters to importers. Such as the UK, according to the current production rate, its oil resource will be sustained for seven years. With the exhaustion of resource and increase of consumption, Britain which has become an importing country will continue to expand the scale of import.

1.4 Africa

In 2013 Africa's recoverable reserve rate is 37.7, ranking the third in the world. It is the region whose oil reserve and oil production grow the fastest in recent years, known as the "Second Gulf." Africa's total proven oil reserves are mainly distributed in the Gulf of Guinea in West Africa and North Africa. The top five oil reserve countries are Libya, Nigeria, Angola, Algeria and Sudan. The oil production in these five countries accounts for about 85% of Africa's total. In the region, Libya has a high recoverable reserve rate, which is 86.9% in 2013. The followings are Nigeria, Sudan, Nigeria and Gabon, whose recoverable reserve rates are all more than 40 years. At present, the important exporting countries of Egypt, Congo, Algeria, Angola, Chad and Equatorial Guinea

have a ratio of recoverable reserve between 16.0- 36.1. Egypt has the minimum recoverable reserve ratio of 16.1. Considering reserves and production, Libya and Nigeria are the important long-term exporters in the world crude oil trade pattern. The reserves will be somewhat less in Algeria and Angola, who will be larger exporters in the world crude oil trade pattern in the short term, but in the long-term is unsustainable. Reserves in other countries are all below 0.5% of the world oil reserves.

1.5 Central and South America

Latin America is an important region of the world oil production and export, and also has a fast growth in oil reserves and oil production. Venezuela, Ecuador and Peru are the regions with the richest oil reserves. Venezuela's recoverable reserve ratio is more than 100, Ecuador and Peru's recoverable reserve ratio are 44.6 and 31.5 respectively. In fact Peru has a lower reserve, but due to the relatively low production, it has a relatively high ratio of recoverable reserve, while other countries' are about 10 years. According to the recoverable reserve ratio and reserve, Brazil and Ecuador's oil supplies to the world are difficult in the long run. As a current importer, Peru is facing a depletion of its own resource, and in the near future will import more oil from abroad to meet its development demand of oil consumption. In the long run, no matter in reserve or recoverable time, Venezuela will be an important country in the world oil trade spatial pattern.

1.6 Asia-Pacific Region

In 2013, the recoverable reserve ratio of the Asia-Pacific region is 13.6. In the eight oil-producing countries, only Vietnam, Brunei and Malaysia are exporting countries, of which Vietnam's recoverable life is the longest of 34.5 years. Australia, Brunei, India, Malaysia and China's recoverable reserve ratio re 23.4, 19.0, 17.5, 11.1 and 11.4 years respectively. Thailand's is only 2.8. Therefore, with the economic development and resource exhaustion of the Asia-Pacific, the importing countries will increase import volume, while exporting countries will adjust the supplies of crude oil, crude oil import will be further increased in the Asia-Pacific region.

In summary, due to resource depletion, the countries which not only produce oil but also import oil, such as Thailand, the United Kingdom and India, etc. will further expand the scale of import; the countries with a relatively lower recoverable reserve ratio and higher consumption, such as Norway and Romania, etc. will reduce the proportion of export to ensure the domestic supply of crude oil. Their function of export in the international trade will be reduced, and their adjustment of trade tendency is bound to affect the world oil trade spatial pattern; among the countries with a relatively higher recoverable reserve ratio, Russia, Angola, Oman, Ecuador, Yemen and Canada, etc. have relatively more abundant oil resources. They are the major mid-term suppliers in

the world crude oil trade; there are five countries whose recoverable reserve ratio is more than 100, of which two are Iran and Iraq in the Middle East, and the remaining three countries are South Sudan in Africa, Canada in North America and Venezuela in South America; In addition to these countries, the countries with a recoverable reserve ratio of more than 30 include Ecuador and Peru in Central and South America, Italy and Kazakhstan in Middle and Western Europe, Kuwait, Qatar, Saudi Arabia, Syria, UAE and Yemen in the Middle East, Chad, Nigeria and Sudan in Africa. If there was not the major discovery of oil, except for Italy and other big resource consumption countries, the countries with a high recoverable reserve ratio would be the world's crude oil supply regions in the future. However, considering reserves, the Middle East is the main source of long-term supply of the world crude oil trade.

2. RELATED FORECASTS OF THE WORLD OIL DEMAND

After the 1973 oil crisis, people began to be keen on

predictions of oil prices, production and demand. At present, the influential forecasts on the world oil demand are made by IEA and the US Energy Information Administration. The two predictions have some differences, but are basically the same in the structure. North America, Asia and Europe are high oil consumption areas. Looking from the growth rate of consumption demand, the developing countries in the Asia-Pacific region, such as China and India, are the world's fastest oil consumption growing countries; followed by Africa and the Middle East, but due to the low consumption base, in 2030 they will still be relatively lower export consumption countries; although the US' consumption growth is relatively lower, it's still the world's largest oil consumer, followed by China and India. According to the US Energy Information Administration forecast, the corresponding values in Japan, Korea, Canada and Russia, etc. will remain basically unchanged.

It can be seen from the prediction results that North America, Asia Pacific and Europe remain the world's oil trade import regions, while China, India, the United States and Korea will become the world's largest importers.

Table 1
IEA 2006 - 2030 World Oil Demand Forecast

Country or Region	Demand (100 million tons)					2006—2030 Annual Growth Rate (%)
	2000	2006	2010	2015	2030	
OECD's Total	23.0	23.8	24.6	25.5	26.5	0.5
North America	11.7	12.5	13.1	13.9	15.0	0.8
Europe	7.1	7.2	7.3	7.4	7.4	0.1
POA	4.2	4.1	4.2	4.2	4.1	0.0
Transition Economy	2.1	2.3	2.4	2.6	2.8	0.9
Russia	1.3	1.3	1.4	1.5	1.7	0.9
Developing Country	11.8	14.5	16.9	19.5	26.9	2.6
China	2.4	3.6	4.5	5.6	8.3	3.6
India	1.2	1.3	1.6	1.9	3.3	3.9
Other Asian Countries	2.3	2.8	3.1	3.5	4.5	2.0
Middle East	2.3	3.0	3.5	4.0	4.8	1.9
Africa	1.2	1.4	1.6	1.7	2.4	2.2
Latin America	2.4	2.4	2.6	2.8	3.6	1.6
International Marine Fuel Filling and Inventory Change	1.8	2.1	1.9	2.0	2.3	—
World	38.7	42.7	45.8	49.6	58.5	1.3
EU	6.8	6.9	6.9	7.0	6.9	0.0

Note. "—" indicates no data.

3. ANALYSIS ON THE REGIONAL STRUCTURE CHANGE IN THE WORLD CRUDE OIL TRADE

3.1 Changes in the Nature of Import and Export of Trading Countries

Resource endowment is the decisive factor of the crude oil

trade function, and recoverable reserve ratio determines the duration of a country's trading function. An exporting country with a relatively low recoverable reserve rate will have a shorter exporting function in the international crude oil trade, and vice versa. This book takes 15 and 30 as the dividing line to classify the countries with different recoverable reserve ratios. Colombia and Denmark, etc. which have a relatively low recoverable reserve ratio, in

the premise of no major oil resource discovery, will soon adjust their crude oil export and become the importing countries instead in the world's crude oil trade spatial pattern. As the United Kingdom, the world's crude oil exporter in previous years and the major Western European oil producing country, in 2007 and 2008 has become a net importer of crude oil. For the countries with a relatively high ratio of recoverable reserve, they're less likely to adjust the trading function in the near future, especially those countries with a slow economic growth and low energy consumption. However, as time goes the higher recoverable reserve rate countries will gradually exit; those which can eventually become the world's crude oil supplying regions are the high recoverable reserve ratio countries such as Saudi Arabia, the United Arab Emirates

and Libya. That is, over time, the oil-producing countries will continue to face a resource depletion, thus transit from oil-exporting countries to be importing countries. Exporting countries will gradually reduce. In 2013, there were 37 exporting countries in the world crude oil trade, assuming the current production rate and reserves remain unchanged, 30 years later there will be only 13 countries which are still able to export crude oil. At the same time, because of the world economic growth, the countries which can basically supply their own needs at present will have to increase import of crude oil due to inability to meet their own demands, thus the number of exporting countries will gradually become less in the world crude oil trade, while the number of importing countries will gradually be increased.

Table 2
Country Classification Based on Recoverable Reserve Ratio

Recoverable reserve ratio	Country
6—15	Colombia, Denmark, Norway, England, Turkmenistan, Mexico, Argentina, Indonesia, Republic of Congo, Peru
15—30	Brazil, Trinidad and Tobago, Egypt, Syria, Algeria, Brunei, Tunisia, Chad, Angola, Malaysia, Ecuador, Azerbaijan, Oman, Russia, Yemen, Romania, Uzbekistan, Equatorial Guinea, Gabon, Canada
≥30	Sudan, Vietnam, Nigeria, Qatar, Libya, Saudi Arabia, Kazakhstan, Iran, UAE, Kuwait, Venezuela, Iraq

3.2 Trade Connection Changes in Trade Patterns

Looking from the countries' oil trade strategies in the world, diversification is the primary means of oil-importing countries to avoid the risks of oil import, so there is a rising trend in the world oil trade links in recent years. However, the rise of the trade links in the world crude oil trade spatial pattern will slow down. There are two reasons: Firstly, security is not the sole goal for each crude oil importing country to pursue. In the pursuit of diversification of importing sources, economical efficiency is also taken into consideration; secondly, simply pursuing diversification and taking indiscriminately every exporting country as the partner will not help solve the security problem, but increase the risk. Because oil trade is influenced by the situation of oil-producing countries, diplomacy, passage security and other factors. Therefore, although in theory, the maximum amount of the world crude oil trade links is the product of the exporting country number and the importing country number, the number of the real trade links in the world trade crude oil trade spatial pattern is far less than this value. In the middle to long term, with the increase of exporting country number and decrease of importing country number, the exporting trade links in the world crude oil trade spatial pattern will be more dispersed, while the importing trade links will be more concentrated.

3.3 Regional Structural Changes in Trade Patterns

Exporters with a low recoverable reserve ratio are mostly distributed in the Americas and Western Europe, namely these countries will transit to be importing countries in

a very short time. The number of importing countries in Western Europe and North America will increase; the countries with a relatively high recoverable reserve rate are generally in Africa, so in the middle term, if there is no significant finding, the number of exporting countries in Africa will reduce, and the remaining countries are located in the Middle East, the former Soviet Union, Asia and North and South America; among the thirteen countries with a high recoverable reserve ratio, six are in the Middle East, four are in Africa, and one each in Asia, South America and Central Asia. However, considering the reserve, the Middle East has an absolute advantage, so the major exporting region in the future world trade pattern is the Middle East. With the development of developing countries in the Asian-Pacific region, such as India and China, the region will further enhance the energy consumption. Particularly the recoverable reserve ratios of the oil-producing countries in the region are not high, Thailand's is 3.5 years, China's is only 9.9 years. Despite India and Australia have a longer recoverable time than China, they have less reserves, so their future oil consumption will mainly rely on import. Similar import-relying countries are North America and Western Europe. These three regions are the major importing regions in the future world oil trade.

CONCLUSION

Resource endowment is the decisive factor of oil trade pattern. In the absence of major exploration technological

breakthrough and major oil resource discovery, importing countries will gradually increase, while export countries will gradually reduce. In the middle and long-term, exporting trade links in the world crude oil trade spatial pattern will be more dispersed, while the importing trade links will be more concentrated. The future exporting region in the world trade pattern is mainly the Middle East.

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